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Funkentelegraphische Uebermittlung von Witterungsnachrichten auf dem atlantischen Ozean. Ergebnisse einer Studienreise im August 1908. (S.-A. Marine-Rundschau.) Berlin. [1908.]

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Ergebnisse der Beobachtungen an den Stationen II. und III. Ordnung...1903. Berlin. 1908. xvi, [123]-267 p. f°.
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Ergebnisse der meteorologischen Beobachtungen in Potsdam 1905. Berlin. 1908. vi, 107 p. f°.
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Ergebnisse der Niederschlags-Beobachtungen im Jahre 1906. Berlin. 1908. xxxiv, 165 p. f°.
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Die Expedition des Königlich preussischen meteorologischen Instituts nach Burgos in Spanien zur Beobachtung der totalen Sonnenfinsternis am 30. August 1905. Von G. Lüdeling und A. Nippoldt. Berlin. 1908. 92 p. f°. (Abhandlungen Bd. 2. Nr. 6.)
Barometrische Teildepressionen und ihre wellenförmige Aufeinanderfolge. Von W. Wundt. Berlin. 1904. 25 p. f°. (Abhandlungen...Bd. 2. No. 5.)

Richardson, H. W.
Relations of the U. S. Weather bureau to the railroad man. (*In* official proceedings of the Northern railway club. Duluth, Minn. Jan., 1907. p. 22-31.)

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...Ergebnisse der meteorologischen Beobachtungen 1904. Dresden. 1908. 88 p. f°.

Schwere, S.
Wetterinstrumente, Wetterkarten und die Wettervoraussage. Zürich. [1908] 39 p. 8°.

Steinmetz, Helmuth.
De ventorum descriptionibus apud Græcos Romanosque. Gottingæ. 1907. 88 p. (Inaug.-diss.—Gottingen.)

Timberg, Gustaf.
Populär meteorologi... Stockholm. 1908. viii, 206 p. 4°.

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Sammlung von Arbeiten, ausgeführt von Studenten am Meteorologischen Observatorium der Universität zur Jurjew (Dorpat). Band 2, 1908. Yuriev. 1909. 183 p. 8°.

AN ANNOTATED BIBLIOGRAPHY OF EVAPORATION.

By MRS. GRACE J. LIVINGSTON. Dated Washington, D. C., January 8, 1908.

[*Continued from the Monthly Weather Review, November, 1908.*]

1870—*Continued.*

Dufour, Charles, and F. A. Forel.
Recherches sur la condensation de la vapeur aqueuse de l'air au contact de la glace et sur l'évaporation. Bul. soc. vaud. sci. nat., 1870, **10**:621-84; Les mondes, 1871, **26**:129-36, 183-9, 242-51. Abstracted in Arch. sci. phys. et nat., 1871, **40**:239-73; Ann. chim. et phys., 1871, **25**:80-1; Naturforscher, 1872, **5**:59-60.

A study of the hygrometric action of glaciers on the atmosphere and vice versa. Conclusions: (1) With air having a vapor pressure less than 4.6 millimeters condensation or evaporation will take place at the surface of the glacier according to the relative pressures of the water vapor of the air and that of the ice. These actions tend to counterbalance each other. (2) Condensation takes place whenever the atmospheric vapor pressure is above 4.6 millimeters. (3) The total result of condensation and evaporation must be very much in favor of the latter. (4) The glacier by these counteracting influences tends to restore the pressure of the water vapor in the air to 4.6 millimeters, except in the case of condensation at temperatures lower than zero. (5) Since, in the latitudes studied, the average hygrometric capacity of the air is above 4.6 millimeters pressure, the glacier exercises a very powerful drying influence on the atmosphere. (6) Condensation tends to prevent the extension of the glacier owing to the heat which it frees.

Forel, F. A., and Charles Dufour.

See Dufour, Charles, and F. A. Forel.

Hajech, Camillo.
Ricerche sperimentali sull' evaporazione di un lago. Rend. r. ist. lomb., 1870, **3** (2):785-90.

Compares the evaporation from three similar instruments exposing a free water surface 1 decimeter square, one floating on the surface of the lake, the second on land near the the lake, and the third on land, but farther from the lake. The results obtained from August 31 to October 7, show: (1) The maximum mean hourly evaporation occurred from all three on the same days, viz, September 16 and 17. (2) The quantities evaporated from the three in the daytime, were to each other as 100:140:149; when the sky was cloudy as 100:130:130; after sunset as 100:156:225; and for the entire day as 100:150:180.

Henry, D. Farrand.
Tables of evaporation from observations of the survey of the northern and northwestern lakes. Tables showing comparative readings of evaporators in lake and river, open air, and water. Rpt. Chief Eng., 1870: 570-3.

A table of results shows the difference between simultaneous readings of the evaporator at the meteorological station and one placed in the water at Youngstown, N. Y., from June 11, to September 23, 1869. Evaporation was greatest on land, the ratio between the two being 0.558. Thermometric observations of the air, of the surface of the water in the evaporators, and in the lake showed no definite ratio between the water temperature and the rate of evaporation.

Lamont, Johann von.
Langsam Verdunstung des Wassers in engen Röhren. Münch. Stern. Wochenbl., 1870, (—):263.

Moscati, Pietro.
Lettera al Signor de Saussure con la descrizione d'un atmidometro e d'altre macchine altinenti alla meteorologia. n. p. 1870. 4to.

Pfaff, A. B. I. F.
Ueber den Betrag der Verdunstung einer Eiche während der ganzen Vegetationsperiode. Sitzber. k. bayer. Akad. Wiss. math. phys. Kl., 1870, **1**:27-45. Also Ber. Phys. Med. Soc., 1870, **2**. Abstracted in Zeits. Oest. Ges. Met., 1871, **6**:10-2. Also Naturforscher, 1871, **4**:85-7. Also Gaea, 1871, **7**:247-9.

See Hann, 1871, for the results of Pfaff's experiments.

Risler, E.
Evaporation du sol et des plantes. Arch. sci. phys. et nat., 1870, **37**:214-28. Also Zeits. f. Naturw., 1872, **6**:117-9.

The monthly evaporation during 1869 from soil of different depths is calculated from the difference between the amount of rainfall and the amount artificially drained off, the latter amount being at least partially corrected by a periodic determination of the moisture content of the soil.

Somerville, Mary.
Physical Geography. London. 1870. 6th ed. p. 223.

The fact that the sea water of the Southern Hemisphere contains more salt than that of the Northern is supposed to be due to the greater evaporation in the former, caused by the southeast trade winds blowing over a greater expanse of water than the northeast. It is computed that 186,240 cubic miles of water are evaporated (annually ?) from the surface of the globe, chiefly from intratropical seas. This would cause a lowering of the sea level by 5 feet annually. The equilibrium in these seas, thus disturbed, is restored by means of currents.

Strachan, Robert.
Lamont's vaporimeter. Symons's met. mag., 1870, **5**:73-4.

For a description of this instrument see Lamont, 1869.

Symons, G. J.
On evaporation. Brit. rainf., 1870, (—):175-83, (app.).

Experiments were carried on at Strathfield Turgiss with different evaporators, including Howard's, Miller's (a tin vessel with overflow, felt protected), Miller's sand evaporator, a glazed earthenware jar set in the ground, a glass cylinder, Proctor's, Sharples', Fletcher's, etc., of various sizes, etc. Observations on the temperature of the water in each showed that vessels which absorb heat most readily allow much more evaporation than others. A table gives the amount of evaporation for 1870 at various localities in Great Britain, with a description of the methods employed. The large tank used at Strathfield Turgiss is especially notable.

Vogel, K. A.
Versuche über die Wasserverdunstung auf besätem und unbesätem Boden. Abh. k. Bayer. Akad. Wis. math. phys. Kl., 1870, **10**: 321-55.

From experiments similar to those of his previous paper (see 1868) it is concluded that evaporation is greater from limestone soil than from clay soil; greater from unplanted soil, both clay and limestone, than from planted; but greater from peat soil when planted than when unplanted. Results obtained with the "atmidometer, (see Vogel and Reischauer, 1856), showed differences similar to those observed in the absolute humidity of the air over the different soils.

1871.

Buchan, Alexander.
Introductory Text-book of Meteorology. Edinburgh. 1871.

See Buchan, 1868, for an account similar to that on p. 88-91 of this work.

Casella, L.
Catalogue of Scientific Instruments. London. 1871. 8vo. p. 24.

Two metal vessels are described for measuring evaporation from a free water surface, also a recording instrument, in which the changes in the level of a water surface are communicated to a recording cylinder by means of a float and pulley. Doctor Babington's "atmidometer" for measuring evaporation from water, ice, or snow, is mentioned on page 21, but not described.

Dines, G.
Reply to "On Evaporation of Water," by Henry Hudson in Symons's met. mag., 1871. Symons's met. mag., 1871, **6**:190-2.

The following statements, made in a previous article, 1870, are reaffirmed: "When the air is saturated with moisture and the water is of the same temperature as the air, neither evaporation nor condensation can take place." "Except as it affects the dew-point, it is a matter of little consequence whether the air is saturated or not; other circumstances being the same, it is the difference between the temperature of the water and that of the dew-point which determines the amount both of evaporation and condensation." The author's experiments with the wet- and dry-bulb thermometers in obtaining the dew-point lead him to think that they can never give more than an approximation to the moisture in the atmosphere Hudson's conclusion that water may evaporate at a temperature several degrees below the dew-point when the air is nearly saturated is refuted.

Dufour, Louis.
Sur le siccimètre. Ann. chim. et phys., 1871, **23**:78-80.

The siccimeter is designed to measure the difference between evaporation and rainfall (see Dufour, 1869.)

Hann, Julius.
Ueber den Einfluss der Bäume auf die Feuchtigkeit der Atmosphäre und des Bodens. Zeits. Oest. Ges. Met., 1871, **6**:10-12.

The experiments of Unger, 1861, Vaillant, 1865, and Pfaff, 1870, in attempting to calculate the total evaporation from a large tree by means of the observed amount evaporated from a single branch are here reviewed. According to Pfaff an oak tree having 700,000 leaves, each with a surface of 2,325 sq. mm., would evaporate from May 18 to October 24, 120,000 kg. This means an evaporation from the surface of the ground which the tree covered, of 5.39 meters while the rainfall for that area is only 0.65 meter. According to Hann, however, this does not show the amount that would evaporate under natural conditions. In the woods the temperature is low, the humidity is high, and the air movement very sluggish. At night evaporation ceases and dew is formed, and in the daytime only a very small portion of the leaves at the top are subjected to the conditions under which the branches were placed in Pfaff's experiments.

Hann, Julius.

Verdunstung auf den Azoren und auf Madeira. Zeits. Oest. Ges. Met., 1871, **6**:411.

Table of monthly percentage of clouds, evaporation in millimeters, wind velocity, etc., from December [1854?] to January, 1857.

Hoffmann, H.

Untersuchungen über die Bilanz der Verdunstung und des Niederschlages. Zeits. Oest. Ges. Met., 1871, **6**:177–81. Versuchsstat. Org., 1872, **15**:95–104. Abstract in Naturforscher, 1871, **4**:324–5. English abstract by Robert Warington, in Jour. Chem. Soc., 1872, **10**:1038–9.

Reviews the work of Unger, Schübler, Laws, Hartig, Saussure, Pfaff, etc. Unger's observations that a water surface evaporates about three times as much as a plant of the same surface, and that a forest in leaf evaporates much more than a water surface of the same area as the ground covered by the forest, are contradicted by Hartig who showed that evaporation from a water surface or from bare soil is greater than from a forest. Schübler's results are quoted, showing daily evaporation to be, from a water surface, 1 line; from turf, 2 to 3 lines; from bare soil, 0.60 lines; and from forest, 0.25 lines.

The author's own experiments, at the Botanical Garden in Seissen, Germany, with evaporation from a water surface in a glass vessel, showed a total amount lost by evaporation from May to September for 3 years (1855-8) to be 55.86 inches, with a rainfall of 45.68 inches. The author believes, however, that soil would not lose moisture at the same rate as the water surface in the experiment, the upper layers of the soil protecting the lower. He considers it important, therefore, in a dry climate to keep the soil covered with moss or dead leaves to prevent its drying out.

Hudson, Henry.

On evaporation of water. Symons's met. mag., 1871, **6**:166–8.

Challenges the conclusions drawn by Dines, 1870, concerning the point at which water will cease to evaporate and condensation will begin, and apparently concludes that water will evaporate when at a temperature several degrees below the dew-point.

The statements in this paper are vague and were later refuted by Dines, 1871.

Mann, R. J.

On evaporation, rainfall, and elastic force of vapor. Proc. Brit. met. soc., 1871, **5**:285–97. Also London. 1871. 8vo.

From experiments with evaporation of water at different temperatures, the following formula is derived: The depth of evaporation in inches per hour $= 1.5\sqrt{T+\{1-(\frac{e}{e_1})\}D}$ where T = the absolute temperature (° F.) of the surface of the water (that is, 461° + the ordinary scale); e = the vapor pressure in inches in air; e_1 = the vapor pressure at the temperature of the evaporating water, and D = the density in pounds avoirdupois per cubic foot of the vapor at the temperature of the water. Altering the formula so as to use Glaisher's hygrometric tables only, a complicated expression is deduced, together with a simpler one which is sufficiently approximate. The latter is as follows: $E = 0.04 \times$ (the vapor pressure at the temperature of the water) − (the vapor pressure at the temperature of the air), i. e., $E = 0.04\,(e_1 - e)$. It is concluded that evaporation depends almost wholly on the three factors, the area of the water surface, the temperature of the water at its surface, and the vapor pressure in the air above the water. The retarding influence of the height of the rim of the vessel above the evaporating surface is also shown. Experiments with evaporation from sea water resulted in a rate of evaporation 5 per cent smaller than that from fresh water. The evaporation from the eastern side of the North Atlantic is calculated at 58.56 inches annually.

Risler, E.

Évaporation du sol et des plantes. Arch. sci. phys. et nat., 1871, **42**:220–63. Zeits. f. Naturw., 1872, **6**:117–19.

Continuation of the author's paper of 1870.

1872.

Abbot, Francis.

Results of five years' meteorological observations for Hobart Town, with which are incorporated the results of twenty-five years' observations previously published by the Royal Society of Tasmania, and completing a period of thirty years. Tasmania. 1872. 8 p.

A pluviometer and an evaporator were employed for these observations. The latter is a dish 5 inches in diameter, having an overflow pipe a little below the rim. A table shows the total excess of evaporation over rainfall at Hobart Town for the five years 1866–70 was 95.58 inches. The average annual evaporation is 42.18 inches and the rainfall 23.06 inches.

Buys-Ballot, C. H. D.

Ueber die Verdunstung von einer Wasseroberfläche. Zeits. Oest. Ges. Met., 1872, **7**:223–5.

Refers to the work of Schulze, Vogel, Vivenot, Field, and Symons. Emphasizes the need of having a large evaporating surface, also the need of protecting the walls of the vessel either by sinking it in the ground or placing it in a larger reservoir of water. A table of results obtained by A. Erlich Sterk with two instruments, one small and unprotected, the other a large cylinder placed in a larger reservoir, shows a difference of 250.5 millimeters in a year. The difference is greater in the daytime than at night, 209 millimeters for the former and only 41.7 millimeters for the latter. The author obtained only 70 millimeters difference in similar experiments, but his smaller instrument was somewhat shaded.

Buys-Ballot, C. H. D.

Suggestions on a uniform system of meteorological observations. Utrecht. 1872. 56 p.

Advises uniformity of apparatus for measuring evaporation.

Buys-Ballot, C. H. D.

Indications de deux évaporimètres, l'un exposé selon la manière habituelle, l'autre nageant dans l'eau libre, ou dans un très-grand réservoir. Bul. int. de l'obs. de Paris, 4 Juin, 1872.

Fritsch, Karl.

Bemerkungen über die Beobachtungen mit dem Verdunstungsmesser. Zeits. Oest. Ges. Met., 1872, **7**:124–7.

Emphasizes the important influence which the exposure of the atmometer may exert on the rate of evaporation. Summarizes the results of observations at Prague from 1833–37, at Vienna from 1868–70, by Vivenot in 1866–7, and Schenzl in 1863–5.

Karsten, Gustav.

Luftfeuchtigkeit, Niederschläge, Verdunstung, in den Herzogthümen. Beiträge zur Landeskunde der Herzogthümer Schleswig und Holstein. Reihe II, Heft II. Berlin. 1872. 4to.

Lemoine, G.

On the relation of forests to hydrology. Paper read to the British Association, Brighton meeting, 1872. Abstract in Symons's met. mag., 1872, **6**:161.

Describes experiments by Chapman on evaporation in South Africa. Two jars were sunk in the ground, one protected by a bush and the other in cleared ground. The rate from the latter jar was more than double that from the former. The evaporation during the hot, windy, dry season of the district, is believed to exceed by 334,000 gallons, the amount that would have been evaporated if the bush and grass had not been burned off.

Moureaux, Th.

Note sur l'atmismomètre de M. Piche. Bul. int. de l'obs. de Paris, 2, 3, Juin, 1872.

Pfaff, Fr.

Versuche über Verdunstung. Zeits. Deut. Geolog. Ges., 1872, **24**:401–9.

The evaporation at Erlangen from pure water and from a 2.5 per cent salt solution for a year resulted in totals of 750 and 659 millimeters, respectively, or as 100 to 87. Observations of evaporation from pure water for the two years previous, and of the rainfall, which in all three years surpassed the amount evaporated from salt water, led to the conclusion that salt could not be obtained here by natural evaporation from a bay separated from the ocean.

Piche, Albert.

Note sur l'atmismomètre, instrument destinée à mesurer l'évaporation. Bul. assoc. sci. de France, 1872, **10**:166–7; also Sci. pour tous, 1872, **17**:226; Ann. sci. ind., 1872, **16**:58–60; and Zeits. Oest. Ges. Met., 1873, **8**:270–1.

This instrument consists of a vertical graduated glass tube, 1 centimeter in diameter 23 to 30 centimeters long, closed above and provided with a ring by which it can be suspended. The tube is filled with water, a circular piece of moist blotting paper with an area of 8 square centimeters, is clamped over the open end, the whole inverted and the water allowed to evaporate from the surface of the paper. The differences in the height of the water in the tube give the amounts evaporated. A minute opening in the center of the paper allows air to rise and take the place of the evaporated water.

Prettner, Johann.

Ueber einen einfachen Verdunstungsmesser. Zeits. Oest. Ges. Met., 1872, **7**:319.

Describes a metal vessel in which to expose a surface of water for evaporation. A fixt needle point marks the standard level.

Ragona, D.

Sulla evaporazione dell' aqua salea. In Lettere meteorologiche al conte G. Vimercati. Rev. sci. ind., 1872. Also Florence. 1872. 8vo.

Symons, J. G.

On evaporation. Brit. rainf., 1872, (—):11–15.

Refers to a self-recording atmometer devised by Symons and Field. A table shows the rate of evaporation in different localities, measured by various methods. Evaporation was generally 10 to 15 per cent less in 1871 than in 1870. A table of monthly evaporation in the neighborhood of Manchester is appended.

Volpicelli, Paolo.

Sulla evaporazione dei liquidi, favorita della elettricità. Att. r. accad. Lincei, 1872, **25**:63–6.

Provenzali, in the Rev. sci. ind. de 1871, p. 119, stated that, "The action of static electricity on the evaporation of liquids is a fact that has generally past unnoticed, neither do I know that any one has ever closely examined it." Volpicelli shows that this statement is ungrounded, since many eminent investigators have attempted to solve this problem. He describes the researches of Cavallo, Hermbstadt (See Hermstädt, 1801), Van Marum, Schübler, Muncke, Nollet, and Beccaria. With the exception of Van Marum and Muncke, who obtained negative results, all the experiments together with his own which he describes have shown that electrification of water increases the evaporation from it.

1873.

Buys-Ballot, C. H. D.

A sequel to the suggestions on a uniform system of meteorological observations. Utrecht. 1873.

See Buys-Ballot, 1872, 1st title.

Decharme, C.

Effets frigorifiques produits par la capillarité jointe à l'évaporation; évaporation du sulfure de carbone sur du papier spongieux. (Extrait). Compt. rend., 1873, **77**:998, 1157.

A porous paper dipping into carbon bisulphide and supported in the air, is described as a very simple hygroscope. The drier the air, the less the cooling, the less rapid the evaporation, and the less the deposit of crystals.

Delesse, A. and A. de Lapparent.

Influence des forêts sur la quantité de pluie et sur l'évaporation. Rev. geol., 1873, 11. Also Bul. assoc. sci. de France, 1873, **12**:190–1.

Dufour, Louis.

Observations sicclmètriques à Lausanne. Bul. soc. vaud. sci. nat., 1873, **11**:151–62, 329–32; 1873, **12**:162–9.

Continuation of Dufour, 1870.

Ebermayer, E.

Die physikalischen Einwirkung des Waldes auf Luft und Boden, und seine klimatologische und hygienische Bedeutung. Aschaffenburg. 1873. Abstracts in Zeits. Oest. Ges. Met., 1873, 8:253–5; and in Fortsch. f. Met., 1873: 140–5.

Evaporation from a free water surface in a forest is found to be about 64 per cent less than in the open, both summer and winter. The loss from the surface of a saturated soil, 6 inches deep, is three or four times less in the forest than in the open. Evaporation from two soils, one covered with straw, the other bare, is compared and found that the litter contributes as much to the holding of soil moisture as the forest itself. The amount evaporated in the open during six summer months was 409 mm., while from bare forest soil it was 158 mm., and from forest soil covered with litter only 62 mm. These observations illustrate the influence on river supply exerted by the presence of forests.

Lapparent, A. de, and A. Delesse.

See Delesse, 1873.

Leslie, Alexander.

On rainfall and evaporation in its relation to water supply. Trans. roy. Scot. soc. arts, 1873, 8:243–61.

A comparison of the annual rainfall with the run-off in the district of Reiroch Burn shows a loss of 12.72 in., as due to evaporation.

Marié-Davy, H.

Évaporation du sol et des plantes. Bul. mens. obs. phys. cent., 1873, 2:111–21, 155–62, 189–94.

It is stated that the rate of evaporation depends on the rate of movement of the air as measured by the anemometer, and on the difference between the elastic force of the vapor of the evaporating water and that of the vapor contained in the air, as measured by the psychrometer. Evaporation from plants and soils is determined by daily weighings of potted plants and pots of soil without plants. A table compares the evaporation from a Piche instrument with that from dishes of bare soil, the latter exhibiting from one to two times as great a rate as the former. Soil temperatures are deduced from the evaporation rate. Daily evaporation from growing grain (June, 1873), is compared with that from bare soil and from water with very varying results. Further experiments are elaborated along the same lines.

Marié-Davy, H.

Radiations solaires et évaporation des plantes. Bul. mens. obs. phys. cent., 1873, 2:173–9.

In a study of the effect of color, as shown by observations of Déhérain on evaporation from leaves of maize in sunlight transmitted thru colored solutions, the highest rate of evaporation was produced under orange light, with red, blue, and green following in the order named.

Miller, S. H.

Evaporation. Brit. rainf., 1873, (—):204–8 (app).

The author attempts to discover "some law of relation between the amount of water evaporated and the temperature of evaporation or that of the dew-point," but does not obtain "such results as would give constants for evaporation." New evaporometers for use with soil are described.

Mott, A. J.

Periodicity of rainfall. Letter to the Editor. Nature, 1873, 7:161.

General discussion of the relations between rainfall, evaporation, and wind. Solar spots, by causing temperature inequalities and the formation of barometric differences, are said to give rise to special areas of evaporation.

Stefan, J.

Versuche über die Verdampfung. Sitzber. k. Akad. Wiss. (Vienna), math. naturw. Kl., 1873, 68 (pt. 2):385–428. Abstracts in Zeits. Oest. Ges. Met., 1882, 17:63–8; and Phil. mag., 1873, 46:483–4.

From experiments with evaporation of ether from narrow tubes the following laws are deduced: (1) The velocity of evaporation of a liquid from a tube is inversely proportional to the distance of the surface of the liquid from the open end of the tube. This holds closely when the distance slightly exceeds 10 millimeters. (2) The rate of evaporation is independent of the diameter of the tube (for diameters between 0.3 and 8.0 millimeters). (3) The rate of evaporation increases with the temperature so far as this is accompanied by an increase in the vapor pressure of the liquid. When p = vapor pressure of saturated air at the temperature of the observation, and P = the atmospheric pressure under which the liquid evaporates, then the rate of evaporation is proportional to $\log \frac{P}{P-p}$. If the vapor pressure of the liquid equals that of the atmosphere this expression becomes infinity, and the liquid boils.

Also describes experiments in which the open end of an otherwise closed tube is dipt in ether. Bubbles are emitted from the tube and when the tube contains air the times in which successive equal numbers of bubbles form are at first proportional to the odd numbers. If the immersed tube contains hydrogen instead of air, the same number of bubbles form in one-fourth the time, whence he concludes that evaporation proceeds in hydrogen four times as rapidly as in air.

Stevenson, Peter.

Description of the atmometro-hygrometer. Trans. roy. Scot. soc. arts, 1873, 8:160–3.

Two thermometers were inverted, the bulb of one being inclosed in one of Leslie's (1813) porous bulbs, the latter being kept wet by a cotton wick. The wick was fed from a glass tube reservoir with a graduated scale. From the indications of this instrument and by the use of Glaisher's hygrometric tables, the dew-point and relative humidity could be determined, and successive observations of the level of the water in the graduated tube gave the rate of evaporation.

Symons, G. J.

(Bibliography of evaporation.) Symons's met. mag., 1873, 8:196.

The editor gives a short bibliography of the literature of evaporation.

Symons, G. J.

On evaporation. Brit. rainf., 1873 (—):203–4 (append.).

A table is presented of monthly evaporation at various points in Great Britain, as measured by different instruments. The results vary between annual totals of 7.96 inches and 40.26 inches.

A small metal dish, allowing evaporation from a free surface of water, is described, in which the level of the water is measured by a brass scale divided to hundredths of an inch. The temperatures of the water in this vessel, of the air, and of a running stream were compared on three different dates; the water in the evaporator was always at a higher temperature than that of the air or of the running stream.

1874.

Bateman, J. F.

Evaporation of snow. Proc. inst. civ. engin., 1874, 39:34.

A discussion of Binnie, 1874, on the Nagpur Waterworks. Rapid evaporation of snow during the prevalence of an east wind was observed even at temperatures below the freezing point.

Binnie, Alexander R.

The Nagpur Waterworks; with observations on the rainfall, the flow from the ground, and evaporation at Nagpur, and the fluctuation of rainfall in India, and in other places, with discussion; edited by John Forrest. Proc. inst. civ. engin., 1874, 39:1–32. Also quoted by Blanford, 1877.

The amount of water used by the city was calculated and subtracted from the total loss from the city storage reservoir. The difference between the two was taken as the amount lost by evaporation. By this method the total depth evaporated from October 10, 1872, to June 1, 1873, was 4 feet, giving a daily average of one-fifth inch. Of the total loss from the reservoir during the dry season 54 per cent was evaporated.

Dufour, Louis.

Observations sicciométriques à Lausanne. Bul. soc. vaud. sci. nat., 1874, 13:371–5.

The average annual evaporation, as shown by the author's sicciometer (described by Dufour, 1869), for the seven years, 1865–73, is 738 millimeters; that for 1874 is 702.5 millimeters.

Hough, G. W.

Self-registering evaporometer and rain-gage. Nature, 1874, 9:250. Noticed in Zeits. Oest. Ges. Met., 1874, 9:93.

An evaporating vessel, 2 feet square and 1 foot deep, was supported on levers held in equilibrium by a small spring, so that any change in weight, due either to rainfall or evaporation was indicated on a scale. A continuous record was obtained upon a revolving drum by means of an electro-magnet and clock-work.

Marriott, William.

Tables for facilitating the determination of the dew-point from observations of the dry- and wet-bulb thermometers. London. 1874. 8vo.

Osnaghi, F.

Modification des Messverfahrens und autographische Einrichtung bei Verdunstungs Apparaten. Zeits. Oest. Ges. Met., 1874, 9:54–6.

Describes weighing and registering apparatus of the type of Wild's spring balance (see Wild, 1874), and also possessing the advantage of recording during the winter.

Scott, Robert H.

Report of the Proceedings of the Meteorological Congress at Vienna. 1874. (p. 53–5, translation of the report of the Committee on Evaporation by Ebermayer.)

The committee adopted Leslie's term "atmometer" for an evaporation gage as possessing "the merits of seniority and a correct classical derivation." All atmometers were divided into two groups, those weighing the losses by a delicate balance, and those measuring the changes in volume. Theoretically the former gives the most accurate results, but requires much attention and very delicate balances; therefore, for general meteorological observations, those of the second class are recommended.

The requirements in a good atmometer of the second class are: (a) The evaporating dish should not be too small, and for comparative results the surfaces should be identical in all instruments. (b) The water level must be kept constant. (c) Reading should be accurate to millimeters in depth. Small instruments for scientific purposes should be sheltered with the thermometer and hygrometer; but for practical purposes larger instruments should be used and should be exposed to the sun and wind and compared with the rain-gage. Various instruments of both types are recommended.

Wild, H.

Ueber einen einfachen Verdunstungsmesser für Sommer und Winter. Bul. acad. imp. sci., 1874, 19:col. 440–6. Also Repert. f. Met., 1874, 10:273–8. Also Acad. sci. mét., 9:51–61. Abstract in Chem. Centbl., 1874, (—): 465–6.

Attention is called to the fact that the rate of evaporation can not be determined by measuring the loss of volume when the temperature is below 0° C. The weighing method, e. g., as embodied in the instrument described (see Shaw, 1877), is the only one then possible. Wild gives a table of the mean daily evaporation, temperature, relative humidity, and wind velocity at the Central Physical Observatory at St. Petersburg during 1872–3. The mean daily evaporation varied from 0.12 millimeters in February to 2.83 millimeters in June, the average for the year being 0.98 millimeters, or a yearly total of about 350 millimeters. Contemporaneous experiments with an ordinary atmometer, exposing a surface of 1 sq. m., gave 1.4 times higher evaporation during the summer than did the Wild instrument.

1875.

Brown, John Croumbie.

Hydrology of South Africa; or details of the former hydrographic condition of the Cape of Good Hope, and of the causes of its present aridity, with suggestions of appropriate remedies for this aridity. London. 1875.

The phenomenon of evaporation is discussed on p. 158. On p. 194 et seq. are described experiments which were made by Mathieu, one of the directors of the Forestry School at Nancy, France, and published by the French government in the Atlas météorologique de l'observatoire impérial for 1867. The rate of evaporation from a vessel of water placed in the ground and surrounded by trees was found to be about one-fifth of that from a similar vessel in the open. Experiments in the neighborhood of Capetown, S. Africa, showed the retarding influence upon evaporation produced by the protection from wind afforded by nearby vegetation.

Decharme, C.

Note sur l'évaporomètre au sulphure de carbon. Bul. assoc. sci. de France, 1875, 17:55–8. Also Bul. int. de l'obs. de Paris, 23 Oct., 1875.

The idea suggested in a paper by Decharme, 1873, is here developed. As the Piche instrument, with water, could not be used in time of frost, carbon bisulphide was placed in the tube instead of water. The formation, during the evaporation of this substance, of a thick border of frost on the paper was regarded as a factor whose relation with other meteorological phenomena might furnish useful indications. The curve of the rate of evaporation of carbon bisulphide was shown to be the inverse of that of water. Under average circumstances, causes favoring evaporation from water and retarding that from carbon bi-

sulphide are dryness, heat, and increase of vapor tension, but increased velocity of the wind acts in a similar manner upon both. Thus curious anomalies are produced in the correlative curves.

Mohn, H.

Grundzüge der Meteorologie. Berlin. 1875. Reviewed in Fortschr. f. Met., 1875.

A general definition of evaporation on p. 77-8.

Wollny, Ewald.

Der Verdunstungsmesser von Johann Greiner. Zeits. Oest. Ges. Met., 1875, 10:255-6.

An evaporating dish, with vertical sides, and 113 millimeters in diameter, has a tube with a stop-cock leading from the center of its base. One hundred cubic centimeters of water are poured into the evaporating dish and left to evaporate for a certain time. The stop-cock is then opened and the remaining water drained into a graduated tube to measure the amount lost by evaporation.

1876.

Greaves, Charles.

On evaporation and percolation. Proc. inst. civ. engin., 1876, 45: 19-47, 56-62. Also London, 1876. 8vo. Also abstract in Van Nostrand's engin. mag., 1877, 16:48-52. Summarized by Fanning, 1889.

Careful experiments were made to determine the maximum and minimum, total and periodic quantities of (1) rain falling, (2) rain percolating thru soil and re-evaporated from it, (3) rain percolating thru sand and re-evaporated from it, (4) water evaporated from a water surface, and (5) their correlation. The gages used were constructed on the principle of Dalton's gage [see Dalton, 1802, (2)]. The most notable results obtained from these records were: (1) The great magnitude of percolation thru sand at all times; (2) the usual small amount of percolation thru ordinary soil; (3) the large evaporation from, and the entire absence of percolation thru ordinary soil in warm summer weather; (4) that in winter evaporation from soil exceeds that from a water surface, while in summer the evaporation from a water surface is the greater; (5) the shallow depth of the layer of soil below which water may be considered safe from loss by evaporation; (6) the great variations in the annual percolation. The maximum yearly evaporation from a water surface was 27 inches and the minimum, 17 inches. An appendix with 26 tables of results from 1860-73 is given on p. 56-62.

The discussion was continued by John Evans and Doctor Gilbert with accounts of their work along the same lines. Results of various observers are summarized, notably those of Ebermayer in Bavaria in 1873, and those obtained at Rothamsted, near Harpenden, Herts, 1870-5.

Humber, William.

A comprehensive treatise on the water supply of cities and towns. London. 1876. Imp. 4to.

Contains a chapter on rainfall and evaporation.

Morgenstern, Ludwig.

Ueber ein neues Atmometer. Repert. f. Met., 1876, 12:520-38.

(See below, Symons, 1876, for description.)

Murray, Digby.

Ocean currents. Nature, 1876, 15:76-7. Reviewed by Ramsay, 1884.

Discusses the cause of ocean currents, but does not decide whether the greater amount of evaporation occurs in the northern or the southern hemisphere.

Stelling, Ed.

Beobachtungen über Verdunstung in Tiflis von A. Noeschel bearbeitet von E. Stelling. St. Petersburg. 1876. 4to. Also Repert. f. Met., 1876, 5: No. 9, 9 p. Abstract in Zeit. Oest. Ges. Met., 1877, 12:315-6.

Evaporation in the sun and shade was observed from April to November, together with rainfall, temperature, humidity, cloudiness, and wind velocity. Daily observations during June and July, 1872, showed the rate from the atmometer exposed in the sun averaged 2.2 times that from the shaded one. Observations from May to September, 1875, gave the corresponding ratio as 2.6. The apparatus was built by A. Noeschel, and consisted of two communicating vessels, one 25.4 centimeters in diameter and 19 centimeters deep; the other, 5 centimeters in diameter and 19 centimeters deep. A float in the second indicated changes in level against a scale graduated to tenths of a millimeter, on the glass tube in which it was free to move.

Symons, G. J.

Account of the Loan Exhibition at South Kensington. Symons's met. mag., 1876, 11:156-9.

Describes forms of evaporometers designed by Lamont, Osnaghi (see 1874), Skertchley, Ebermayer, and Morgenstern. Skertchley's apparatus consists of two vessels, one set within the other, the inner holding the evaporating water while the outer one is covered and acts as a reservoir. Over the whole is a glass vessel which receives the water vapor. Ebermayer's is a simple apparatus for determining the amount of evaporation from different kinds of soil.

Morgenstern's evaporometer presents a saturated surface of siliceous sand, the loss by evaporation from this surface being replaced by water from a burette forming a Mariotte's bottle. A tube entering from below supplies air as the water is withdrawn. The evaporating vessel is enveloped by some heat-insulating material.

1877.

Baumgartner, Georg.

Ueber den Einfluss der Temperatur auf die Verdampfungsgeschwindigkeit von Flüssigkeiten. Sitzber. k. Akad. Wiss. (Vienna), math. naturw. Kl., 1877, 75 (pt. 2): 679-88.

A mathematical discussion of diffusion coefficients after Stefan, 1873.

Blanford, H. F.

Meteorology of India. Indian Meteorologist's Vade-Mecum, pt. II. Calcutta. 1877. p. 16, 55, 100.

Regnault's formula for latent heat of evaporation is quoted as follows: $Q = 1091.7 + 0.305 (t-32)$ units of heat, where Q is the total quantity of heat required to raise water from 32°F. and to evaporate it at t°F. A general discussion of evaporation and its effects is followed by tables of observations in India by Laidlay, 1845, and by T. G. Taylor at the Madras Observatory between 1830-43. Taylor observed the evaporation from a free water surface in a cylindrical copper vessel; the evaporation being increased by the action of the sun on the metal sides of the vessel, but, on the other hand, the surface was somewhat protected from the wind by the walls of the vessel. The mean daily evaporation for the thirteen years was 0.35 inch. Ludlow, 1846, found 0.25 inch per day, Binnie, 1874, in the very dry climate of Nagpur, found 0.198 inch from a large reservoir, and Jackson, 1885, found 0.125 inch per day from a tank.

From these results Blanford assumes 0.10 inch as the daily evaporation from the seas around India and estimates the total evaporation per square mile as 232,320 cubic feet, or a weight of 14,475,000 pounds, requiring, at 80°F., the absorption of 7,975,725,000 units of heat.

Cantoni, Giovanni.

Su l'evaporazione dell'acqua e delle terre, e sugli evaporimetri. Met. ital. sup., 1877 (pt. 1):56-61.

Results of experiments made from May 31 to June 8, upon the rate of evaporation from water, saturated coarse sand, and saturated finer sand, confirm the results obtained by Marcet, 1853, along the same lines. Similar results were obtained with another series of experiments from June 12 to July 9. The temperature was found to be much higher in the lower layers of sand than in the upper layers while it was but little higher near the bottom of the water than above. The temperature of the sand was uniformly lower than that of the water. Experiments showed a higher rate of evaporation from soils with vegetation than from those without. The results of a comparison of the rates of evaporation from different instruments emphasize the necessity of perfect uniformity in form, exposure, and management of atmometers in comparative studies. Other observations showed lower temperatures and less rapid evaporation in forested than in unforested regions.

Frisiani, P.

Sulla dipendenza dell' evaporazione dell' area e della figura della superficie liquida evaporante. Rend. r. ist. lomb., 1877, 10:537-50.

Experiments with evaporation of water (1) from vessels of similar form and different area, (2) from vessels of equal area and different perimeter, (3) from vessels in which the surface of the liquid was at different levels, indicate that other factors besides the area of the surface complicate the phenomenon, and that, therefore, the relative indications furnished by different instruments are not comparable.

Johnen, Adolf.

Forstlich-meteorologische Beiträge. Centbl. Agr. Chem., 1877, Heft VI, 325-27. Abstract in Forsch. Geb. Agr. Phys., 1878, 1:257-8.

A study of the relation of rainfall to evaporation at different stations with forest covers of different ages, disclosed the fact that the difference (rainfall-evaporation) increases as the forest becomes older.

Léger, A.

Hygrométrie et évaporométrie. Communication présentée à la société des sciences industriales de Lyon dans la séance du 27 Juin, 1877. Lyon. 1877. 8vo. 22 p.

Marié-Davy, H.

Evaporomètre et autres appareils enregistreurs de l'Observatoire de Montsouris. Jour. de phys., Paris, 1877, 6:201-3.

The recording "evaporometer" here described consists of a weighing apparatus connected with a recording drum. Another form consists of a dish filled with water, in which floats a hollow ball of zinc, which by means of a rack on its stem operates the pinion of a pointer moving over a graduated dial. Snow and ice interfere with the operation of this instrument, but do not invalidate the self-registering balance first described.

Milani, Gustavo.

Corso elementaire fisica e meteorologia. Milan. 1877.

Statement of laws of evaporation and a discussion of the methods of measuring its rate on p. 698 and 1351.

Miller, S. H.

On a self-registering atmometer. Quart. jour. roy. met. soc., 1877, 3:9-17.

Describes an elaborate arrangement in which the evaporating vessel, exposing a free water surface, is surrounded by a closed compartment divided horizontally into two sections. The upper section contains water, and is planned to maintain the evaporating surface at a constant level, the lower receives any overflow due to rainfall. The amount evaporated is determined by weighing the whole apparatus. Evaporation from this atmometer closely agrees with that from a tank 6 feet square.

Ragona, D.

Evaporimetro registratore. Ann. soc. met. ital., 1877, 1:321-4.

Remarkable results of evaporation and rainfall. Sci. Amer., 1877, 36:257.

A discussion of the general relation between evaporation and rainfall. The evaporation from the aqueous surface of the earth must be much greater than that from the land. Therefore practically only the evaporation from the aqueous surface or three-fourths of the whole surface of the earth provides the rainfall for the whole, and the evaporation from a given surface of land must surpass the amount of rainfall for that area. Seas which have no outlet, as the Great Salt Lake, Utah, and the Caspian, must become more and more salt as the inflowing water continues to evaporate.

Shaw, William Napier.

Report on evaporimeters. Comparison of observations of the rate of evaporation of water as given by different instruments. Quarterly Weather Report of the Meteorological Office for 1877. London. 1885. p (35)-(42).

Observations were made with evaporometers designed by Wild, Lamont, De la Rue, and Piche. The Wild instrument exposes a free water surface in a shallow cylindrical dish 17.8 millimeters in diameter supported on the short arm of a lever balance. The longer arm, acting as a counterpoise, ends in a pointer which moves over a graduated quadrantal arc, indicating the loss of weight due to evaporation. Lamont's instrument (see Lamont, 1868), with a diameter of about 3 inches, possesses two uncertainties in its manipulation: (1) The last portion of water drains but slowly from the pan when the piston is raised, so that one may obtain readings differing by several scale divisions according to the time that the pan is allowed to drain. (2) The annular space between the piston and cylinder supports by capillarity a variable amount of water, which introduces an error in the readings. A dust film on the surface also interferes with the action of evaporation.

In the De la Rue form the water evaporates from a surface of moistened parchment paper stretched over a shallow drum of 5 inches diameter supplied with water from a reservoir giving about 6 inches head and fitted with a constant level device. A graduated glass cylinder shows the amount lost by evaporation. It is intermittent in its action, as the water in the graduated vessel is replaced only by the ascending of large bubbles of air, and at times the slightest jar causes a rapid rise of bubbles, so that, with judicious shaking, any reading within wide limits may be obtained. The reading is sensibly affected by changes in temperature and pressure.

With the Piche instrument (see Piche, 1872) there are three difficulties: (1) A certain difference of pressure between the air inside and outside the tube is required to force the bubbles through the paper, and this may not be constant. (2) The condensation of water on the

sides of the tube on the water surface. (3) *Considerable variations in temperature and* barometric pressure affect this instrument as they do De la Rue's. Factors were determined for the reduction of the indications of the other instruments to those of the Wild. A table shows the percentage of difference between the corrected results. The Wild instrument *seems to have become less and less sensitive as time elapsed, probably due to the formation* of the dust-film which remained undisturbed on the evaporating surface. The following condensed table shows that evaporation decreases as the evaporating area increases:

	Wild.	De la Rue.	Lamont.	Piche.
Area (square centimeters)	245.8	125.6	49.2	11.1
Total evaporation (millimeters)	26.52	32.35	43.57	54.7
Evaporation per square centimeter	0.108	0.258	0.886	4.928

Weilenmann, A.

Die Verdunstung des Wassers. Schweiz. met. Beob., 1877, **12**:268, 368. Reprinted Zürich. 1877.

Derives the following formula for calculating the daily evaporation, h, from the temperature, psychrometer difference, and wind velocity:

$$h=\mu_1\left(\Sigma\frac{m}{a+\lambda}+\gamma\cdot\Sigma\frac{mv}{a+\lambda}\right),$$

where μ_1, γ, and λ are constants to be determined from observation, v is the wind velocity at the surface of the water in kilometers per hour, a is the change in the vapor tension of saturated air for 1°C., m is the saturation deficit in grams per cubic meter, and Σ is the factor necessary to reduce the evaporation from observed time to a desired time. The results calculated by this formula closely agree with those actually observed.

Weilenmann, A.

Berechnung der Grösse der Verdunstung aus den meteorologischen Factoren. Zeits. Oest. Ges. Met., 1877, **12**:368.

Quantities calculated by the formula of the preceding paper closely agree with quantities observed at Vienna, September, 1874, to January, 1877, with a weighing apparatus, and at Montsouris from July, 1873, to April, 1875, with a Piche instrument.

Zeithammer, L. M.

Ueber die Wasserverdunstung des Bodens. Oest. landw. Wochenbl., 1877, (-):512.

1878.

Bartoli, A.

Sulla evaporazione: nota. Florence. 1878. 8vo. 10 p. Also Riv. sci. ind.

Bebber, W. J. van.

Die allgemeinen Niederschlagsverhältnisse mit besonderen Berücksichtigung Deutschlands. Forsch. Geb. Agr. Phys., 1878, **1**:341–76.

In connection with a discussion of humidity the author illustrates and describes the Piche evaporometer.

Boussingault, Joseph.

Études sur les fonctions physiques des feuilles: transpiration, absorption de la vapeur aqueuse, de l'eau, des matières salines. Ann. chim. et phys., 1878, **13**:289–393.

Experiments with transpiration from leaves showed great differences between sun and shade. Calculates that an acre of beets loses 8,000 to 9,000 kilograms of water in twenty-four hours.

Cantoni, Giovanni.

Sugli evaporimetri. Mem. met. ital., 1878 (pt. 4):67–71. Also Rome. 1879.

Reviews experiments by Tacchini, Ragona, Stefan, Bartoli, and Frisiani. They show, in general, the great influence of the design and exposure of the atmometer. Cantoni's experiments, compared the Piche, the Vivenot-Ragona, and the modified Piche (see Cantoni, 1879). He concludes that the different specific heats of the liquids and the different conductivities of the containing vessels were the chief causes for the observed differences in evaporation.

Johnson, S. W.

Studies on the relations of soils to water. Ann. rpt. Conn. agr. exp. sta. for 1877. New Haven. 1878. p. 76–81.

Leslie, Alexander.

See following entry.

Leslie, John and Alexander Leslie.

Notes on evaporation at Glencorse. Jour. Scot. met. soc., 1878, **5**:108–9.

Observed evaporation of water in an iron vessel 6 feet in diameter. Tables of monthly evaporation near the filters at Glencorse [Edinburgh] reservoir during 1857–76 show the yearly total varying between 14.70 inches in 1868 and 9.19 inches in 1866.

Lorenz, J. R.

Entwurf eines Programmes für forstlich-meteorologische Beobachtungen in Oesterreich. Mitt. forst. Versuchsw. Oest., 1878, **2**:73–91. Abstract in Forsch. Geb. Agr. Phys., 1878, **1**:248–57.

Considers observations of evaporation a necessary part of observational meteorology.

Marié-Davy, H.

Rapport au Ministre sur les travaux de l'observatoire de Montsouris pendant l'année 1876–7. Ann. de l'obs. de Montsouris, 1878, (-): 187, 323–7, 413–15, 456–7.

A general discussion of the evaporation of water. Describes the Piche atmometer, and the Delahaye, which consists of a protected tank with a float and self-recording instruments. Diagrams of evaporation and rainfall are reproduced.

Mascart, E.

Influence de l'électricité sur l'évaporation. Compt. rend., 1878, **86**:575–6. Also Les Mondes, 1878, **45**:461–3. Abstract in Proc. inst. civ. engin., 1878, **53**:390.

The electric phenomena accompanying evaporation, observed by Volta and Pouillet, from which they concluded that evaporation is the source of atmospheric electricity, have been explained on the ground that the electric phenomena were due to the nature of the walls of the vessel, and not to the evaporation itself. Mascart's experiments show, however, that electricity accelerates evaporation.

Miller, S. H.

Prize essay on Evaporation. Utrecht. 1878. 4to. 27 p. Also Brit. rainf., 1890, (-): 17–29.

According to Symons, Miller gives average results of three years' experiments at Wisbech with evaporation from water, and from soil with and without vegetation, in the following table:

Evaporating surface.	Annual evaporation.	Relative amounts.
	Inches.	*Per cent.*
Water	17.02	100
Peat	13.62	80
Sand	14.03	83
Clay	13.58	80
Garden mould	15.12	89
Garden mould (in shade)	6.27	37
Long grass	48.16	283
Short grass	23.50	138
Red clover	53.44	314
White clover	31.15	183

Modena, Reale Osservatorio

Osservazioni sulla evaporazione. Ann. soc. met. ital., 1878, **1**.

Ragona, D.

Evaporazione all' aria libera e al sole. Ann. soc. met. ital., 1878, **1**:115–18.

Ragona, D.

Importance des observations relatives à l'évaporation. Compt. rend., 1878, **7**:491–2.

In the general expression for the amount of evaporation, which takes into account relative humidity, temperature, and velocity of the wind, the author found at Modena coefficients similar to those obtained by Tacchini at Palermo. The rate of evaporation in the sun was found to be nearly three times that in the shade. From the mean daily evaporation in sheltered shade the total annual evaporation in the open air and sun is computed at 2.611 meters. In discussing the paper Tacchini calls attention to the fact that measurements of evaporation for meteorological purposes are quite different from those made for agricultural purposes, the results with small tube atmometers used by meteorologists having no application to agriculture, where nothing less than a surface 1 meter square should be used.

Thomson, C. Wyville.

Geography. Opening address to Geographical Section of the British Association by the President. Nature, 1878, **18**:449. Abstract by Ramsay, 1884.

This paper includes a discussion of the influence of evaporation on ocean currents. The constant inward current through the Straits of Gibraltar is said to be necessary to keep up the supply of water in the Mediterranean, where evaporation is greatly in excess of the precipitation.

Todd, Charles.

Meteorological observations, made at the Adelaide Observatory, during 1876 and 1877. Adelaide. 1878. 246 p. Reviewed in Symons's met. mag., 1879, **14**:72–3.

The atmometer used in these experiments was similar to the large tank at Strathfield Turgiss. The average annual evaporation for the six years, 1870–5, was 67.309 inches, and the average annual rainfall was but 24.479 inches.

Vogel, K. A.

Ueber Wasserverdunstung von verschiedenen Vegetations-decken. Sitzber. k. bayer. Akad. Wiss., math. phys. Kl., 1878, **8**:539–45.

The number of grams of water in a cubic meter of atmosphere over different soils with different plant covers, was determined by means of a hygrometer. The results of earlier (1868) experiments are corroborated in the following points: (1) The evaporation from soil with vegetation is considerably greater than from soil without. (2) The kind of plant has a decided influence on the amount of water evaporated.

Wheeler, W. H.

Arterial drainage and the storage of water. Jour. roy. agr. soc., 1878, **14**:1–60.

Includes a discussion of the relations between evaporation and rainfall as bearing on the storage of water.

[*To be continued.*]